A

Ph.D. SYNOPSIS / WORK PLAN

on

EFFECT OF CROP RESIDUES AND HERBICIDES ON WEED MANAGEMENT IN CEREAL CROPS

Submitted to

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Format for submission of Ph.D. Synopsis / Work plan
For faculty of Science to be submitted in front of RRC
Abstract of proposed work plan/ problem:

EFFECT OF CROP RESIDUES AND HERBICIDES ON WEED MANAGEMENT IN CEREAL CROPS

1. Introduction

Effective weed control is essential for realising yield potential and minimising diseases in cereal crops. There are several reasons for yield losses in wheat but weed infestation is greater than the combined losses of insect pests and diseases and all other attributes. The traditional method of weed control is hand weeding which is very much laborious and time consuming. Herbicide is effective in controlling weeds alone or in combination with hand weeding but it is harmful for the nature (Ahmed et. al.,2005). Beside this another observation was that "herbicides in combination with hand weeding would help to obtain higher crop yield but it efforts high cost of production" (Prasad and Rafy, 1995; Sathyamoorthy et. al., 2004).With rising human health and ecological concerns about the adverse effects of indiscriminate use of farm chemicals research on alternative weed management methods is underway worldwide. Exploitation of allelopathic potential of different crop/plant species for weed management under field conditions is one such approach. Crop allelopathy controls weeds by the release of allele-chemicals from the living plants and/or through decomposition of phytotoxic plant residues (Belz, 2004; Khan et. al., 2005). Sorghum [Sorghum bicolor (L.)Monech] is one of the strongest allelopathic crops which have been extensively used as a cover crop or through incorporation of its residue in soil to control weed. Sorghum is a successful competitor against weeds in fields as empirically known. Sorghum seems to have some inhibiting effects on the growth of weeds. These suggest the allelopathic potential of sorghum and it will be very useful for biological control of weeds. Information regarding aqueous extract of sorghum crop residues for weed management is limited in our country. So, the study deserves to keep the significance in the current research interest in home and abroad about aqueous extract of sorghum crop residues having residual effects on weed control and yield performance to investigate the weed suppressing ability and to determine the optimum dose of aqueous extract of sorghum crop residues for the establishment of an easy, economic and sustainable method for efficient weed management and better yield of wheat.

2. Review of Literature and Development in the subject (Previous work done in the relevant area):

Allelopathy is the ability of plant to inhibit the germination of other plants through the production of allelochemcals (Rice 1984, Inderjirt 1966) which may be present in any parts of the plants, i.e. leaves, roots, fruits, stems, rhizomes and seeds, from where they are released to the soil through volatilization, root exudation, leaching and decomposition of plant residues (Rice 1984, Chou 1990). A number of authors, such as Rice (1984), Rasmussen and Rice (1971) and Nelson (1996) had documented the interference effects of some plants on other crops, prominent of which is the inhibition of germination (Patil, (1992), Djurdjevic et al 2004), reduction in the growth lengths of plumule and radicle (Tobe and Omasa 2000), retardation of seedling growth (Bhatt and Todoria 1990) and poor seedling survival (Smitt 1990). Previous assertions had suggested that allelochemicals inhibit seed germination by blocking of nutrient reserve and cell division thereby caused significant reduction in the growth of plumule and radicle of many crops (Ogbe et al 1994, Tobe and Omasa (2000). Previous studies conducted in Taiwan revealed that Rice (Oryzasativa) planted twice in a year in monoculture system reduced the second crop yield by about 25% in area of poor water drainage (Chou 1980). Also Chou and Chou (1979) found aqueous extract of paddy soil collected bio assayed to be phototoxic. In pot experiment, Chuo (1983) also found rice seedlings growing poorly in the decomposed straw and soil mixture. In Nigeria, allelopathic studies so far reported were based on the allelopathic potentials of weeds on agricultural crops.

The phenomenon of allelopathy plays an effective role in the biological control of the bush through the use of compounds that have the ability to inhibit and reduce the growth of the bush and that are freed from some plants that (Mandel 2000) One of the important strategies to reduce the use of pesticides and improve and protect the environment (Farooq et al. 2008) this phenomenon was used as natural herbicide by means of biochemical interference between plant types using the compounds released from different plant parts(Samad et al. 2008)

3. Objectives of Research/ Proposed Hypothesis:

To Study morphological characteristics of some common weeds in Cereal crops

To collect crop residues from different sources

To prepare extract of crop residues

To record the effect of crop residues on seed germination of cereal crops

To evaluate the efficacy of different frequently used selective herbicides and their impact on weed species diversity

To evaluate the efficacy of crop residues and selective herbicides on control of cereal crop

4. Methodology to be adopted:

Preparation of extracts

Portions of 5g, 10g, 15g, 20g, and 25g of each of the grounded samples of the crop residues

Each portion will be soaked in 200ml distilled water in 500ml conical flasks. The mixtures were shaken intermittently for 24hrs at 250 C ± 10 C. The extracts for each crop residue was filtered and the filtrates were stored in a refrigerator for further usage.

Effect of crop residues on Seed germination of cereal crops

Bioassay In each treatment, two layers of Whatman No. 1 filter papers wiil put in each Petri dish (with a diameter of 9cm). Five seeds, each of the weeds, will be sown in the Petri dish and each replicated ten times for each extract concentration. The filter papers will be moistened daily with the different extract concentrations using syringe and needle. Control experiments will be set up for each extract residues and were replicated ten times. All the Petri dishes will be arranged on germination tables at room temperature between 25-30OC. The seeds will be considered as germinated upon radicle emergence and the number that germinated will counted and recorded for six days. The radicle and plumule growth elongations will recorded at 24hrs interval. The data obtained from the experiments will compared to those obtained from the control using Analysis of Variance (ANOVA, $P < 0.05$)

Effect of selective Herbicides on Seed germination of cereal crops

Effect of selective Herbicides on Seed germinations of cereal crops by blotter paper method

Effect of Crop residues and selective Herbicides

Effect of Crop residues and selective Herbicides on Seed germinations of cereal crops by blotter paper method and pot culture method

5. Importance of study/ Society application:

International status

Allelopathy is a subject that deals with the effects of chemicals produced by plants, on the growth, development and distribution of other plants in natural communities or agricultural systems (Aslam et al., 2017).The release of allelopathicphytotoxins by plants may be essential to enhance the competitive ability of a plant in a new environment, by inhibiting the growth and life processes of other plant species (Adler & Chase, 2007). This is understood as a complex process occurring in nature to suppress growth of susceptible associated species from the common habitat (Jabran&Farooq, 2013). In addition, allelopathy is a biological phenomenon where organisms produce one or more biochemicals that affect growth, survival, and reproduction of other organisms (Li et al., 2016). The biochemicals released are called allelochemicals and are a part of products released by plants to reduce competition for resources (Gniazdowska&Bogatek, 2005). These allelochemicals are found in various types of plant species and can be released into the environment through a variety of pathways, including from the roots as exudate, by leaching from the leaves or leaf litter, by decomposition, or as a volatile gas (Fig. 1.2) (Farooq et al., 2011). The 5 phenomenon of allelopathy is very important in the functioning of natural communities because allelopathy also impacts on microorganisms and other soil organisms (Chon & Kim, 2002).Plant allelochemicals can have strong effects, such that even small doses have the potential to inhibit germination and growth of other plants (Lawson et al., 2013). The impact of these compounds on surrounding plants is greater at early growth stages, resulting in the inhibition of seed germination and growth of seedlings (Khan et al., 2011).

National Status

Information regarding aqueous extract of sorghum crop residues for weed management is limited in our country. So, the study deserves to keep the significance in the current research interest in home and abroad about aqueous extract of sorghum crop residues having residual effects on weed control and yield performance to investigate the weed suppressing ability and to determine the optimum dose of aqueous extract of sorghum crop residues for the establishment of an easy, economic and sustainable method for efficient weed management and better yield of wheat.Combating the weed, especially using chemical pesticides, until their use has now become one of the basic agricultural operations because of their great economic importance. However, the widespread use of chemical pesticides increased the risk of environmental pollution, as they were found to cause harmful effects on human health due to their indiscriminate use Xuan et al. (2004) The continuous use of pesticides produces generations of weeds that are resistant to these pesticides, in addition to being polluting the

environment. For these reasons, research in recent years has tended to find an alternative that is more beneficial.

Significance of the study

With rising human health and ecological concerns about the adverse effects of indiscriminate use of farm chemicals research on alternative weed management methods is underway worldwide. Exploitation of allelopathic potential of different crop/plant species for weed management under field conditions is one such approach. Crop allelopathy controls weeds by the release of allele-chemicals from the living plants and/or through decomposition of phytotoxic plant residues (Belz, 2004; Khan et. al., 2005). Sorghum [Sorghum bicolor (L.)Monech] is one of the strongest allelopathic crops which have been extensively used as a cover crop or through incorporation of its residue in soil to control weed. Sorghum is a successful competitor against weeds in fields as empirically known. Sorghum seems to have some inhibiting effects on the growth of weeds. These suggest the allelopathic potential of sorghum and it will be very useful for biological control of weeds.

6. Proposed work Plan/ Formulation and Structure of Study: Year-wise Plan of work and targets to be achieved

First Year

Survey of weeds from cereal crops in Nanded district

Study of morphological characters of some common weeds

Second year

Collection of crop residues from Agriculture fields

Allelopathic effect of crop residues on weeds

Effect of selected Herbicides on seed germination of common weeds

Third Year

Effect of Crop residues and selective Herbicides on Seed germinations of cereal crops

Thesis writing

Submission of Pre Ph. D. Synopsis

Submission of thesis

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